



GOOD
MANAGEMENT
PRACTICES FOR
ANIMAL HANDLING
AND STUNNING

*Original guidelines
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These guidelines are a supplement to the 1991 *Recommended Animal Handling Guideline for Meat Packers*. The main emphasis of this guide is on the use of a welfare performance standards which can be objectively scored instead of specifying equipment design or practices. Scoring procedures for accessing animal welfare and recommendations which will help improve animal welfare are described. The recommended scoring procedures are simple enough to be conducted easily under commercial conditions and they should be conducted a minimum of once a week. Scoring should be done at both the beginning and the end of a shift to determine the effect of employee fatigue. If a score falls below the acceptable range specified in the guide, plant management should take steps to correct the problem. The results of the 1996 Survey of Stunning and Handling in Federally Inspected Beef, Pork, Veal and Sheep Slaughter Plants (sponsored by USDA's Animal and Plant Health Inspection Service) indicated that the recommended minimum acceptable levels specified in this guide can be achieved easily at a minimum of expense. Objective scoring should be done in the following areas which are critical control points for good animal welfare. The minimum acceptable percentage scores in this guide were determined by the author based on over twenty years of practical experience in over 100 different slaughter plants.

1. Percentage of pigs and sheep where the electric stunner was placed in the wrong position.
2. Percentage of cattle which had to be shot more than once with the captive bolt stunner.

3. Percentage of sensible and partially sensible animals on the bleed rail.
4. Percentage of animals falling down or slipping.
5. Percentage of cattle vocalizing in the stunning chute area, which includes the stunning box, restrainer, lead-up chute and crowd pen.
6. Percentage of pigs vocalizing in the stunning pen or restrainer conveyor.
7. Percentage of animals prodded with an electric prod.
8. Non-ambulatory animal procedures. Scoring procedures need to be developed at this critical control point.

Poor performance in any one of the above critical control points would result in reduced welfare. This guideline also contains criteria for stunning equipment and recommendations which will enable a plant to maintain acceptable welfare scores. Other areas of welfare concern which will be covered are ritual slaughter and the handling of non-ambulatory animals.

STUNNING

Electrical Specifications for Electric Stunning - Electric stunning equipment must operate within electrical parameters which have been verified by scientific research to induce instantaneous insensibility. Scientific research has shown that an electric stunner must have sufficient amperage to induce a grand mal seizure to insure that the animal will be made instantly insensible. Insufficient amperage can cause an animal to be paralyzed without losing sensibility. For market weight pigs a minimum of 1.25 amps is required (Hoenderken 1982, Gregory 1988). For sheep a minimum of one amp is required (Gregory and Wotton 1984, Gilbert et al 1991). These amperages must be maintained for one second to induce instant insensibility. The Council of Europe (1991) recommends the above minimum amperages. There must be sufficient voltage to deliver the recommended minimum amperage; 250 volts is the recommended minimum voltage for pigs to insure insensibility (Troeger and Woltersdorf 1989). Research has also shown that too

high of an electrical frequency will fail to induce insensibility. Warrington (1974) found that insensibility was most effectively induced at frequencies of 50 cycles. Frequencies at 2000 to 3000 hz failed to induce instant insensibility and may cause pain (Croft 1952, Van der Wal 1978). However, in pigs weighing under 200 lbs (80 kg) Anil and McKinstry (1994) found that high frequency 1592 hz sinewave or 1642 hz square wave head only stunning at 800 ma (0.80 amp) would induce seizure activity and insensibility in small pigs. One disadvantage is that the pigs regained sensibility more quickly compared to stunning at 50 to 60 cycles. The pigs in this experiment weighed one-third less than comparable U.S. market pigs and this probably explains why the lower amperages were effective.

Some plants stun animals below the Council of Europe recommended minimum amperages in an attempt to reduce blood spots in the meat. Stunning market weight pigs with less than 1.25 amps should not be permitted (Hoenderden 1982, Grandin 1994a) unless different electrical parameters are verified by either electrical or neurotransmitter recordings from the brain. Since only a one second application at 1.25 amps is required to induce instant insensibility in market weight pigs, it is the author's opinion that plants should be permitted to use circuits which lower the amperage setting after an initial, one second stun at 1.25 amps for pigs and one amp for sheep. Plants should also be encouraged to use electronic constant amperage circuits which prevent amperage spiking. Both practical experience and research has shown that these types of circuits greatly reduce petechial hemorrhages (blood spots) (Grandin 1985, Blackmore and Peterson 1981).

Since U.S. market pigs are slaughtered at heavier weights compared to European pigs, an electric stunner must deliver the minimum amperage recommended by the Council of Europe (1991) to insure instantaneous insensibility. It is the author's opinion that high frequency stunning should not be permitted in the U.S. until research is conducted to prove that it is capable of inducing an instantaneous grand mal seizure in heavier U.S. market weight pigs. In the Anil and McKinstry (1994) experiment, the pigs were stunned with a head only applicator. High frequency

stunning has never been verified to induce instant insensibility when applied with a head to body cardiac arrest stunning electrode. This is the type of electrode used in almost all large U.S. pork slaughter plants. However, at the present time, pork plants should be permitted to use higher frequencies in their stunning cycle provided that their initial stun is a minimum of 1.25 amps at 50 to 60 hz for a minimum of one second.

Unlike pigs and sheep, electrical stunning of cattle requires a two-phase stun. Due to the large size of cattle, a current must first be applied across the head to render the animal insensible before a second current is applied from the head to body to induce cardiac arrest (Gregory 1993). A single 400 volt, 1.5 amp current passed from the neck to the brisket failed to induce epileptic form changes in the brain (Cook et al 1991). To insure that the electrodes remain in firm contact with the bovine's head for the duration of the stun, the animal's head must be restrained in a mechanical apparatus. The Council of Europe requires a minimum of 2.5 amps applied across the head to induce immediate epileptiform activity in the EEG of large cattle. A frequency of 60 or 50 cycles should be used unless higher frequencies are verified by either electrical or neurotransmitter measurements taken from the brain.

Electrodes must be cleaned frequently to insure a good electrical connection. The minimum cleaning schedule is once a day. For safety, the electrode wand must be disconnected from the power supply before cleaning. Adequate electrical parameters for cardiac arrest stunning can not be determined by clinical signs, because cardiac arrest masks the clinical signs of a seizure. Measurement of brain function is required to verify any new electrical parameters which may be used in the future.

1. ELECTRIC STUNNING - ELECTRODE PLACEMENT EFFICACY CRITERIA FOR SCORING (Score a minimum of 100 pigs or sheep in large plants.)

- Excellent - 99.5 to 100% correct placement of stunning wand or tongs
- Acceptable 99.4 to 99% correct placement
- Not Acceptable - 98 to 95% correct placement or 4% or less of the pigs vocalize due to energizing the electrodes before they are firmly positioned.
- Serious Problem - Less than 95% correct placement or more than 4% vocalization in response to electrode placement

If head only stunning is used, the tongs must be placed so that the current passes through the brain (Croft, 1952, Warrington 1974). Tongs may be placed on both sides of the head or one tong on the top and the other on the bottom of the head. Another scientifically verified location for head only stunning is one electrode placed under the jaw, and the other is placed on side of the neck right behind the ears. For cardiac arrest stunning of pigs and sheep, one electrode must be placed on the head and the other one may be placed at any location on the body, which will induce cardiac arrest. The head electrode may be placed on the forehead, side of the head, top of the head, under the jaw, or in the hollow behind the ear. The head electrode must never be placed on the neck because this would cause the current to bypass the brain. Electrodes must not be applied to sensitive areas such as inside the ear or in the eye or rectum.

2. CAPTIVE BOLT - STUNNING EFFICACY CRITERIA

(Score a minimum of 100 animals in large plants.)

- Excellent - 99 to 100% instantly rendered insensible with one shot
- Acceptable - 95 to 98% instantly rendered insensible with one shot
- Not Acceptable - 90 to 94% instantly rendered insensible with one shot
- Serious Problem less than - 90% instantly rendered insensible with one shot

If one shot efficacy falls below 95%, immediate action must be taken to improve the percentage.

The survey indicated that the most common cause of a low captive bolt stunning efficacy score was poor maintenance of the captive bolt guns. Guns must be cleaned and serviced per the manufacturer's recommendations to maintain maximum hitting power and prevent misfiring or partial firing. Each plant should develop a system of verified maintenance for captive bolt stunners. Another major cause of failure to render animals insensible with one shot is poor ergonomic design of bulky pneumatic stunners. Ergonomics can sometimes be improved with the use of a handle extension and improved balancers.

Aversive methods of restraint which cause three percent or more of the cattle or pigs to vocalize must not be used as a substitute for improvements in gun ergonomics. Electrical immobilization must never be used as a method for restraining sensible animals prior to or during stunning. Several scientific studies have shown that it is highly aversive (Lambooy 1985, Pascoe, 1986, Grandin et al 1986, Rushen 1986). Vocalizing scoring is impossible in electrically immobilized animals because paralysis prevents vocalization. Electrical immobilization must not be confused with electric stunning. Properly done, electric stunning passes a high amperage current through the brain and induces instantaneous insensibility. Electrical immobilization holds a sensible animal still by paralyzing the muscles. It does not induce epileptiform changes in the EEG (Lambooy 1985). A third cause of missed captive bolt shots is an overloaded or fatigued operator. Scoring at the end of the shift will pinpoint this problem. In some large plants either two stunner operators or rotating the operators frequently may be required.

Stunning to Bleed Interval

Penetrating Captive Bolt Bleed Interval - Does not have to be measured for welfare reasons unless non-penetrating captive bolt is used. Additional study would be needed to determine the recommended interval for non-penetrating captive bolt. All plants surveyed used penetrating captive bolt.

Electric Stunning Bleed Interval - Cardiac Arrest - Sixty second maximum. All large plants are already less than this interval.

Head Only Reversible Electric - Fifteen seconds is strongly recommended (Blackmore and Newhook 1981), 30 seconds maximum (Hoenderken 1983). Scientific research clearly shows that pigs will start returning to sensibility after 30 seconds when stunned by the head only method.

3. BLEED RAIL INSENSIBILITY - Criteria for stunned animals possibly showing partial sensibility. (Score a minimum of 100 animals in large plants.)

- **Excellent** - Cattle less than 1 per 1000
Pigs less than 1 per 2000
- **Acceptable** - Cattle less than 1 per 500
Pigs less than 1 per 1000

Insensibility should be checked at both the beginning and near the end of the shift. The following signs are indicators of possible return to sensibility. Animals displaying any one of these signs must be immediately shot with a captive bolt stunner: 1) rhythmic breathing, 2) vocalizations while hanging on the bleed rail, 3) eye reflexes in response to touch, 4) eye blinking, 5) arched back righting reflex (Grandin 1994, Gregory 1988). Animals should hang straight on the rail and have a floppy head. Limb movements should be ignored. If the tongue is hanging straight out the animal is definitely insensible. Gasping is a sign of a dying brain and should be ignored (Gregory 1988). There should be a zero tolerance for hanging a fully sensible, unstunned animal in an inverted position on the bleed rail.

4. SCORING OF SLIPPING AND FALLING

Good animal welfare and quiet calm handling is impossible if animals slip or fall on the floor. All areas where animals walk should provide non-slip footing. Animals should be observed during all phases of handling and if slipping or falling is observed, steps should be taken to correct it. Slipping on scales, unloading ramps and stunning boxes can often be corrected by installing a grating built from steel bars. A concrete grooving machine is one good method which can be used to roughen an existing floor. Since the survey results indicated that the greatest slipping and falling problems were in the stunning chute area, scoring should be done in this area.

Scoring of Slipping and Falling in the Stunning Chute Area (All Species) (Score a minimum of 50 animals in large plants.)

Includes restrainer entrance, stunning box, lead up chute and crowd pen.

- Excellent - No slipping or falling
- Acceptable - Slipping of less than 3% of the animals
- Not Acceptable - 1% falling down (body touches floor)
- Serious Problem - 5% falling down or 15% or more slipping

5. VOCALIZATION SCORING OF CATTLE

Vocalization is an indicator of cattle discomfort. Dunn (1990) reported that significantly more cattle vocalized when they were held in a restraint device that inverted them on their backs, compared to upright restraint. Preliminary research by Bridgett Voisinet at the author's laboratory at Colorado State University has shown that the number of times that cattle vocalize during a stressful husbandry procedure is related to cortisol (stress hormone) levels.

The 1996 survey results indicated that the percentage of cattle which vocalized in the stunning chute area ranged from three percent or less of the cattle in the three best plants to 12 percent to 32 percent in the two worst plants. Cattle vocalizations in the stunning chute area were

caused by prodding with an electric prod, slipping in the stunning box, missed captive bolt stuns or excessive pressure applied by a restraint device. The survey results showed that plants with a high percentage of cattle vocalizing could easily reduce this percentage. The average vocalization percentage in the two roughest plants was reduced from 22 percent of the cattle to 4.5 percent by reducing electric prod usage.

The 1996 survey results clearly showed that cattle seldom vocalize during handling or stunning unless an easily observed aversive event occurred. A total of 1,125 cattle were vocalization scored and 112 animals vocalized. Only two animals vocalized which were not responding to an aversive event such as electric prodding, slipping, falling, missed stuns, or excessive pressure from a restraint device. Other aversive events which can cause vocalization are hitting cattle with gates or pinching an animal in a restraint device. This indicates that vocalization is an indicator of discomfort.

Criteria for Vocalization of Cattle in the Crowd Pen, Lead-up Chute, Stunning Box or Restraining Device (Score a minimum of 100 animals in large plants.)

- Excellent - 0.5% or less of the cattle vocalize
- Acceptable - 3% or less of the cattle vocalize
- Not Acceptable - 4% to 10% vocalize
- Serious Problem - Over 10% vocalize

When vocalization is being evaluated, cattle from more than one feedlot or ranch should be observed. To make scoring simple, each animal should be classified as either a vocalizer or a non-vocalizer.

Cattle vocalizations should be tabulated during handling in the crowd pen, lead up chute, restrainer or stunning box. Vocalizations occurring in the yards should not be tabulated because cattle standing quietly in the yards will often vocalize to each other. In one plant hungry Holsteins

vocalized and turned to face a man bedding a pen with sawdust. It appeared that they perceived the sawdust as feed.

Observations at one of the sheep slaughter plants indicated that vocalization during handling is absolutely useless as a measure of handling problems in sheep. Sheep walking quietly up the stunning chute often vocalized to each other. Sheep which balked and had to be pushed by a person never vocalized. This is a species difference between cattle and sheep.

6. VOCALIZATION SCORING OF PIGS

Research conducted in commercial pork slaughter plants indicated that the intensity of pigs squealing in the stunning chute area is correlated with physiological measures of stress and poorer meat quality (Warriss et al 1994). Squealing was measured with a sound meter. White (et al 1995) also found that the intensity of pig squeals is correlated with discomfort.

Since it is impossible to count individual pig squeals when a group of pigs is being handled, vocalization scoring of individual pigs can only be conducted in the restrainer. The 1996 survey results indicted that there were two major causes of pig vocalizations. They were mis-applied electric stuns and pinching in the restrainer. The 1996 survey results indicated that vocalization in the restrainer ranged from 0 percent to 14 percent of the pigs. Out of 11 plants, 72 percent (8 plants) had no pigs squealing due to mis-applied electric stuns. In two plants, two percent to four percent squealed during stunning. The use of sound level meters should be studied for monitoring pig vocalizations during handling.

Criteria for Vocalization of Pigs in the Restrainer or During Stunning

- Excellent - 0% or less of the pigs vocalize
- Acceptable - 1% or less of the pigs vocalize due to the restrainer; none due to a misapplied stunner
- Not Acceptable - 2% or more vocalize in the restrainer for any reason
- Serious Problem - 5% or more vocalize in the restrainer for any reason

Restraint Device Principles Which Reduce Stress On Animals and Help Reduce

Vocalization

In several different publications the author has outlined the behavioral principles of low stress animal restraint and handling (Grandin 1991, 1993, 1994, 1995, 1996). Pigs and cattle should enter a restraint device easily with a minimum of balking. Correcting problems with animal restraint devices can also help reduce bruises and meat quality defects such as blood splash. The basic principles of low stress restraint which will minimize vocalization and agitation are:

1. For cattle, block the animal's vision with shields so that they do not see people or objects that move while they are entering the restrainer. Install metal shields around the animal's head on box type restrainers to block the animal's vision.
2. Block the animal's vision of an escape route until it is fully held in a restraint device (Grandin 1991). This is especially important on restrainer conveyors. A flexible curtain of conveyor belts at the discharge end of the conveyor works well. Cattle often become agitated in a conveyor restrainer if they can see out from under the solid hold-down cover before their back feet are off the entrance ramp. Extending the solid hold down cover on a conveyor restrainer will usually have a calming effect and most animals will ride quietly. Solid hold downs can also be beneficial for pigs on conveyor restrainers.

3. Eliminate air hissing and other distractions such as clanging and banging. Refer to section on distractions.
4. The restraint device must be properly lighted. Animals will not enter a dark place or enter a place where direct glare from a light is blinding them. To reduce balking at the entrance of a conveyor restrainer, install a light above the entrance. The light should be above the lead-up chute. It should illuminate the entrance of the restrainer, but it must not glare into the eyes of approaching animals. Light coming up from under a conveyor restrainer should be blocked with a false floor to prevent animals from balking at the "visual cliff effect."
5. Provide non-slip flooring in box-type restrainers and a non-slip cleated entrance ramp on conveyor restrainers. Animals tend to panic when they lose their footing.
6. Parts of a restraint device operated by pneumatic or hydraulic cylinders that press against the animal's body should move with slow steady motion. Sudden jerky motion excites animals. On existing equipment install flow controls to provide smooth steady movement of moving parts which press against the animal.
7. Use the concept of optimum pressure. The restraint device must apply sufficient pressure to provide the feeling of being held, but excessive pressure that causes pain should be avoided. Install a pressure regulator to reduce the maximum pressure that can be applied. Very little pressure is required to hold an animal if it is fully supported by the device. If an animal bellows or squeals in direct response to the application of pressure, the pressure should be reduced.
8. A restraint device must either fully support an animal or have non-slip footing so the animal can stand without slipping. Animals panic if they feel like they may fall. Restraint devices should hold fully sensible animals in a comfortable, upright position.

9. Equip restraint devices with controls that enable the operator to control the amount of pressure that is applied. Different sized animals may require differing amounts of pressure. Hydraulic or pneumatic systems should have controls which enable a cylinder on the device to be stopped in mid stroke.

10. Never hold an animal in a head restraint device for more than a few seconds. The animal should be stunned or ritually slaughtered immediately after the head holder is applied. Head restraint is much more aversive than body restraint.

Animals can be held in a comfortable body restraint for longer periods. The animal's reaction should be observed. If the animal struggles or vocalizes this is an indication that the device is causing discomfort.

11. Restraint devices should not have sharp edges that dig into an animal. Parts that contact the animal should have smooth rounded surfaces and be designed so that uncomfortable pressure points are avoided.

12. On V conveyor restrainers, both sides should move at the same speed.

In conclusion of this animal restraint section, in most plants it is possible to modify existing restraint devices to lower vocalization and agitation scores. Balking at the entrance is also easy to reduce. Most of the modifications that would reduce animal agitation and vocalizations can be installed at a minimum expense. The estimated cost to modify a system is usually between \$200 to \$2000.

7. ELECTRIC PROD USE

Reducing the use of electric prods will improve animal welfare. Many well-managed plants have eliminated electric prods in the holding pens. In beef plants with well-trained handlers, the survey showed that 90 to 95 percent of the animals could be moved through the entire plant without the use of an electric prod. USDA regulations require that electric prods have a voltage

of 50 volts or less. An easy way to test an electric prod to determine if it delivers too intense a shock is to touch an animal for one second with it. If it causes animals to vocalize, the power should be reduced. Prods which have sufficient power to knock an animal down or paralyze it must not be used. Electric prods must never be applied to sensitive parts of the animal such as the eyes, ears, nose or anus.

Electric Prod Scoring Criteria for Cattle

Percentages of Animals Prodded

	<u>Crowd Pen to Chute</u>	<u>Entrance of Stunning Box or Restrainer</u>	<u>Total Percentages of Cattle Prodded</u>
Excellent	none	5% or less	5% or less
Acceptable	5% or less	20% or less	25% or less
Serious Problem	--	--	50% or more

Electric Prod Scoring Criteria for Pigs

	<u>Crowd Pen to Chute</u>	<u>Entrance of Restrainer</u>	<u>Total Percentages of Pigs Prodded</u>
Excellent	none	10% or less	10% or less
Acceptable	--	--	25% or less
Serious Problem which must be corrected	--	--	80% or more

* Electric Prods should never be used on sheep.

Handling Recommendations to Reduce Electric Prod Use and Maintain Efficient Handling

1. **Remove Distractions Which Cause Balking** - such as air hissing, shadows, reflections off shiny metal, ventilation drafts blowing in the faces of approaching animals, and seeing either moving people or moving machinery up ahead. Get down in the chutes and look to find out what the animals are balking at. Install shields or strips of conveyor belting to prevent animals from seeing movement up ahead as they approach the restrainer or stunning box. Reflections can sometimes be eliminated by moving a light. Ventilation drafts blowing down the chutes towards the animals may make it impossible to reduce electric prod use. The plant ventilation system may need to be adjusted.

2. **Provide Adequate Lighting** - Animals may refuse to enter a dark place. Entry into a restrainer can be facilitated by aiming a light into the entrance. The light must NOT shine into the eyes of approaching animals. Animals may be difficult to drive out of the crowd pen if it is brightly illuminated by sunlight and the chute is inside a darker building. Lighting problems can make quiet handling almost impossible. Another common lighting problem is that a handling system may work well when lamps are new, but the animals will balk more and more as lamps dim with age. Experiment with portable lights to find the most efficient lighting. Animals may also balk at shiny reflections off a piece of metal or sparkling water on the floor. Moving a light will often eliminate the reflections.

3. **Reduce Noise** - Animals are very sensitive to high pitched noise. Reducing high pitched motor and hydraulic system noise can improve animal noise can improve animal movement. Clanging and banging metal should be reduced and hissing air should be muffled.

4. **Move Small Groups** - When cattle and pigs are being handled, the crowd pen and the staging areas which lead up to the crowd pen should never be filled more than three-quarters full. Half full is best. Do not push crowd gates up tight against the animals. Cattle and pigs need room to turn. For sheep, large groups may be moved and the crowd pen can be filled all the way up.

5. **Use Other Driving Aids** - Electric prods should be replaced as much as possible with other driving aids such as plastic paddle, a stick with a flag on the end or panels for pigs. The animals should move easily and handlers should not hit them. Cattle and pigs can often be moved along a chute when the handler walks back by them in the opposite direction of desired movement.

6. **Problems With Excitable Animals** - There are some animals which have a very excitable temperament and are difficult to drive. Some lean pigs and cattle are very excitable. These animals will often have high vocalization scores. Plant management needs to work with producers to solve this problem. Pigs with excitable genetics can be made easier to handle at the meat packing plant if producers walk through the pens during finishing. This trains excitable pigs to handling. Producers should be encouraged to produce animals which will be reasonably easy to handle.

8. **NON-AMBULATORY ANIMALS**

Each plant should develop written guidelines and procedures for handling non-ambulatory animals in a humane manner. Dragging sensible non-ambulatory animals is a violation of The Humane Slaughter Act regulations. Stunned, non-ambulatory animals may be dragged. If a skid steer loader (Bob Cat) is used to transport non-ambulatory pigs or sheep, the animal must be rolled into the bucket. Two people are required unless the loader is equipped with a special bucket with a lid. One person operates the loader and the other rolls the animal into the bucket. Loading a non-ambulatory animal into the bucket by shoving it up against a wall or fence is not

acceptable. Bare forklift forks shoved under non-ambulatory cattle is not an acceptable method for moving them.

The AMI and the USDA should develop ways to safely inspect non-ambulatory animals which arrive on the trucks so they do not have to be removed from the truck prior to anti-mortem inspection. Animal welfare would be greatly improved because non-ambulatory animals could be stunned on the truck.

Plant personnel should develop procedures to help reduce the occurrence of non-ambulatory animals on the premises. Non-slip flooring is essential. Mounting activity and animal fights can cause injuries. This is especially a problem with bulls and boars. Bulls which are mounting other animals should be placed in separate pen. Mounting by bulls is a common cause of bruises and crippling injuries on cows.

Ritual Slaughter

Cattle, calves, sheep or other animals which are being ritually slaughtered without prior stunning should be restrained in a comfortable upright position. Small animals such as sheep and goats can be held manually by a person during ritual slaughter. Plants which conduct ritual slaughter should use the same scoring procedures. Stunning scoring would be omitted in plants which conduct ritual slaughter without stunning. Cattle vocalization percentages should be five percent or less of the cattle in the crowd pen, lead up chute and restraint device. A slightly higher vocalization percentage is acceptable because the animal must be held longer in the restraint device compared to conventional slaughter. A five percent or less vocalization score can be easily achieved. Scoring criteria for electric prod use and slipping on the floor should be the same as conventional slaughter.

Pen Stocking Density - Pens should be stocked per the AMI 1991 guidelines. Animals must all have room to lie down. All animals should have access to water.

Maintenance - Pens, alleys, chutes, restrains and other equipment should be kept clean and well maintained. They should be free of protrusions which could injure animals.

Conclusion

An acceptable level of animal welfare can be maintained if scores at the critical control points for stunning, animal insensibility, slipping and falling, vocalization and electric prod use are in the acceptable range. Scoring performance on these variables is simple and easy to do under commercial plant conditions. Electrical stunning equipment must have amperage, voltage, and frequency parameters which have been verified by either electrical or neurotransmitter recordings from the brain to reliably induce insensibility.

In conclusion, managers must be committed to good animal welfare. Plants which have managers who insist on good handling and stunning practices have management that insists that employees handle and stun animals correctly.

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